CURRICULUM

QH
315.5
A33
1962
gr.12

CURRGDHT

ALTA
574
1962
gr.10-12

CURR GD

QUAECUMQUE VERA
EX LIBRIS
UNIVERSITATIS
ALBERTÆNSIS

UNIVERSITY OF ALBERTA
EDUCATION LIBRARY

A Brochure for Teachers of Biology in the High Schools of Alberta

UNIVERSITY OF ALBERTA
EDUCATION

Preliminary Edition

March 1962

Digitized by the Internet Archive
in 2012 with funding from
University of Alberta Libraries

http://archive.org/details/shsbrochureteachbio62albe

This brochure was prepared by the Biology Subcommittee of the Curriculum Committee of the Department of Education for the use of teachers of Biology 20. Much of the material in it, however, will be useful to teachers of other high school biology courses. This preliminary edition will be revised shortly; suggestions will be welcomed.

CONTENTS

1. The requirements for a biology laboratory. 1

2. Basic laboratory equipment, and sources of supply 4

3. Reference material
   (a) Printed 5
   (b) Films, filmstrips, and slides 6
   (c) Charts 7

4. A basic reference library 8

5. Field trips and collections 13

1. THE REQUIREMENTS FOR A BIOLOGY LABORATORY.

Science rooms should be near each other - to take advantage of common teaching equipment, and to economize on installation of utilities.

Natural light is desirable for biology, north light is good for microscopy and drawing, south or southwest for growing plants.

The biology laboratory should be close to other science classrooms to reduce class movement. Its position should be such as to allow for expansion.

35-40 square feet of laboratory space per pupil is desirable, plus storage space. Storage, dark room, and preparation rooms should total 20% of the total area. Access to preparation room from a hallway is desirable. The minimum number of rooms required may be calculated as follows:

$$\frac{\text{No. of biology classes X No. of periods per class per week}}{\text{Total no. of teaching periods per week}}$$

Any biology laboratory should have easily accessible teaching aids and the teacher should be able to move around easily. Provision should be made for shifting activities easily and a wide range of student activity should be possible.

Provision for darkening the classroom should be made. Plenty of electrical outlets should be provided and these should be at convenient places. Conduits to provide for future installation of a central sound system, television (coaxial cable), and radio and television antennae should be installed. Ample chalkboard, large tack board, chart rails, display cases, and a demonstration table are necessary.

Gas, water and electrical lines to student stations should each have a master shut-off valve; preferably in the demonstration table. Fume hoods for poisonous gases must be readily accessible. A first aid kit in each room is necessary and also storage space, which can be locked, for dangerous chemicals. The first aid kit must include antidotes for any poisons which are in the room, and instructions for dealing with poisonings by each of these must be permanently diplayed. Fire extinguishers are necessary.

Biology laboratories should be planned so that, with technician assistance, they can be used every hour of the day.

An aquarium should be available. A battery jar or other large glass container can be filled up from a slough in the fall to provide specimens of water animals and plants. Drawings are given here for a large 30 gallon tank. Approximate cost of this tank without labor and cover is $15. This plan may be easily modified in size to provide a smaller tank that may be kept on a narrow window ledge. Other equipment needed to operate this includes: a filter, preferably using glass wool and charcoal as filtering agents; an aerator pump or an air line from the school pressure system if available; tubing for connections and breaker stones for bubbling air into the tank; tablets for removing or neutralizing the chlorine when supply comes from a chlorinated system.

Aquaria can usually be built at school much more cheaply than they can be bought. Where welding facilities are available, sizes up to 50 gallons capacity can be made by welding a rectangular frame of 1"xl"xl/8" angle iron

with a 1/8" sheet steel base and setting plate glass walls in with aquarium cement. Where there are no such facilities the following design with a plywood frame can be used.

Materials required, for 30 gallon size:

Plywood base - 3/4"x17"x34" - one piece
Plywood ends - 3/4"x14"x16½" - two pieces
Plate glass sides - 2 pieces - size 14"x30".
Threaded steel (iron) rods - two pieces 5/16"x32" and threaded at both ends.
- four pieces 5/16"x15½" and threaded at one end - flattened and bent into a hook at other end.
Mastic tube and gun to apply (caulking material)
Latex or rubber-base paint
Waterproof glue for mortise joint of ends into base
Plywood base supports - four pieces 3/4"x2"x17"

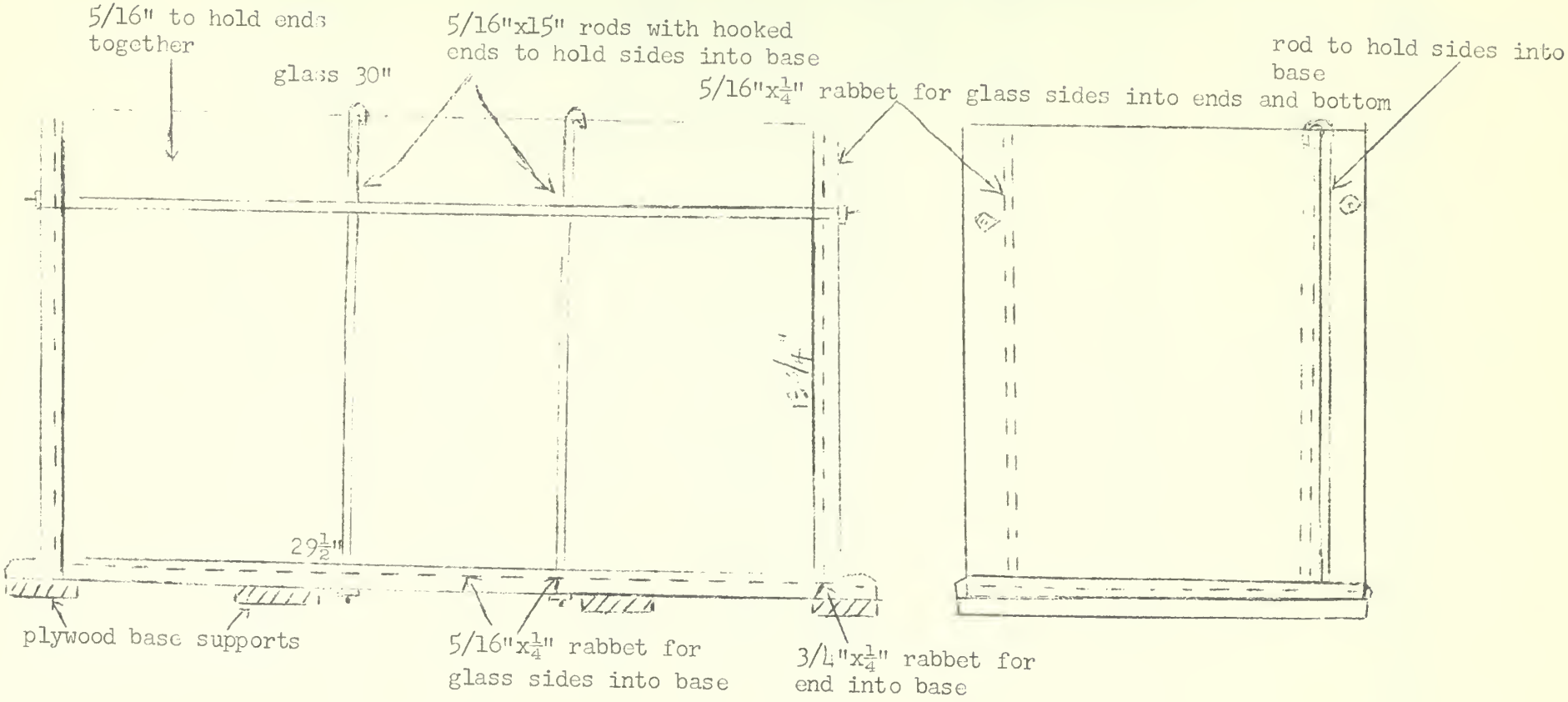
The plywood ends are rabbeted tightly into the base and glued with waterproof glue prior to assembly. The rabbeted grooves for the glass sides into the ends must be loose to allow space for the mastic to make a seal all around. Allow 1/8" or more beyond the glass thickness. Mastic or caulking compound is better than aquarium cement which gets cold too quickly to handle easily. The caulking material must be placed in a uniform cord all along the grooves before the ends and base and sides are assembled together. Rods are essential to hold the ends together and should be threaded on both ends. Do not use wing nuts; ordinary nuts are safer. Rods are needed to hold the sides into the base to keep a seal when the pressure of the water pushes out on the glass. Two coats of rubber base paint (not oil base) will seal the wood. The tank should be filled with water and allowed to stand for a week or more before any animals are placed in it. Empty this water and refill.

A growing area with suitable lighting is necessary. A green house may be planned as an attached unit or separately. A corner with cross-lighting or natural light supplemented by artificial lights can be used. Equipment for this should include: soil storage in a solid box on castors for ease of movement; long shallow trays made of galvanized metal and about one inch deep for window ledges, to protect wood and keep excess water off the floor; water supply threaded for hose; floor drain, large sink.

Maintenance should be considered; plumbing and other service lines should be accessible. Adequate cupboards, shelving, bins, drawers and sink space should be provided. Floors and table tops should be chemically resistant.

Tiering of seats, 4"-5" per row, improves vision both for visual aids and demonstrations.

These recommendations are based on the assumption that class size will not exceed 30 students, and that at this class size at least one laboratory technician will be provided for each teacher. Proper laboratory instruction is not possible with ratios higher than 15 students to 1 supervisory staff.


5/16" to hold ends together
glass 30"
5/16"x15" rods with hooked ends to hold sides into base
5/16"x1/4" rabbet for glass sides into ends and bottom
rod to hold sides into base
13 3/4"
29 1/2"
plywood base supports
5/16"x1/4" rabbet for glass sides into base
3/4"x1/4" rabbet for end into base

SIDE VIEW

END VIEW

Detailed drawings for biological laboratories are on file with the Department of Education. Others are to be found in the reference books in the general section in part 4 of this brochure.

2. BASIC LABORATORY EQUIPMENT AND SOURCES OF SUPPLY

Aquarium - see above
Balances
Battery jars
Beakers
Bioscope, one (attachments are available which permit 35 min. still projectors to be used)
Burners
Clamps
Cork borers and corks
Flower pots, different sizes; supplemented by cans and styrofoam cups
Gauze
Glass tubing and rod
Graduates, 100cc.
Incubator, built in if possible
Instruments, dissecting: 2 probes, 1 scalpel, 1 pair forceps, 1 pair scissors, medicine dropper, brush (1 set per pair of students)
Microscope, one instructor demonstration type with three objectives.
Microscope, one student type with lamp, for every student, and several low power stereoscopic binocular microscopes.
Oven, variable temperature control for sterilization of soil, culture of bacteria, germination, yeast tests, etc.
Petri dishes
Pins, spreading boards, relaxing boxes, labels
Plant presses, herbarium sheets, corrugated cardboard, blotting paper, newspaper.
Reading glasses
Screw cap tubes
Slides and cover slips
Storage cabinets for: herbarium sheets, insect specimens, fossils, skins, skeletons and bones, whole and dissected animal material in liquid preservatives.
Terrarium
Test-tubes
Trays, dissecting
Trays, plastic planting
Tripod stands
Voltage control regulators, 5. For use with electrical outlets in the room. A range of 0 to 120 volts is available in a unit called a Variac (a variable autotransformer).
Watchglasses

Sources of Supply

Obtaining supplies for biological teaching calls for initiative and re-

sourcefulness. It is not to be expected that a teacher can obtain all his needs from a single source. Local materials are often cheaper and easier to obtain: for example plaster of paris costs $17.00 per hundred pounds from a scientific supply house but only $3.00 for the same amount from the local builders supplies. The following addresses may be useful:

Canadian Laboratory Supplies
10182 - 103 Street
Edmonton, Alberta

Cave and Co. Ltd.
1050 West Sixth Avenue
Vancouver 9, B.C.
and
11146 - 86 Street
Edmonton, Alberta

Esbe Laboratory Supplies
459 Bloor Street West
Toronto, Ontario

Fisher Scientific Co. of Canada Ltd.
14730 - 115A Avenue
Edmonton, Alberta

General Biological Supply House, Inc.
8200 South Hoyne Avenue
Chicago 20, Illinois

Mr. H. A. Layfield
Educational and Research Materials
14439 Hayward Street
Whittier, California

Northwest Biological Enterprises
935 Richmond Avenue
Victoria, B.C.

Sharp's Theatre Supplies Ltd.
104 Fourth Street S.W.
Calgary, Alberta

Troyer Natural Science Service
Oakridge
Ontario

Ward's Natural Science Establishment Inc.
P.O. Box 1712
Rochester 3, New York

Western Laboratory Supplies
1008 - 8th Street East
Saskatoon, Saskatchewan

Local: Hatcheries, Nurseries, Breweries, Dairies, Farms, and Meat Packing Plants

3. REFERENCE MATERIAL

(a) Printed:

Many commercial firms publish helpful leaflets and periodical advice regarding their products. Most of these are free on request. They include -

"Carolina Tips", Carolina Biological Supply Co., Elon College, North Carolina

"Turtox News" from General Biological Supply House, Inc.

Turtox Service Leaflets from General Biological Supply House, Inc.

"Ward's Bulletin" from Ward's Natural Science Establishment

Other sources of help include the general periodical literature in the biological sciences, among which some of the more useful publications are -

A.I.B.S. Bulletin. February, April, June, August, October and December. $4.50 per annum. American Institute of Biological Sciences, 2000 P Street N.W., Washington 6,D.C.

The School Science Review. 3 issues annually. November, March and June. About $3.0) per annum. John Murray Limited, Albemarle Street, London W.1.

Scientific American. Monthly. $500 per annum. 415 Madison Avenue, New York 17, N.Y.

Science World. Edition 2 (Grades 10,11, and 12). Bi-weekly. $1.70 per annum. Scholastic Magazines, 33 West 42nd Street, New York 36, N.Y.

Science News. Eight issues per year. $1.50 per annum. Science Publications of Canada, 25 Hollinger Road, Toronto 16, Ontario.

Science Teacher. $6.00 per annum. Includes membership in N.S.T.A. 1201 - 16 Street N.W., Washington 6, D.C.

American Biology Teacher. Hermann C. Kranzer. Burroughs Building, Pennsylvania State University, University Park, Pa.

(b) Films, Film strips, and slides:

In addition to those offered commercially by most of the biological supply houses listed, these may be obtained free or for a modest rental fee from:

Bell Telephone Films can be obtained from the University Department of Extension OR from: Public Relations Department, Alberta Government Telephones, Box 2411, Edmonton, Alberta.

Common Educational Associates Ltd., Pine Grove, Ontario

Common Ground Ltd., 44 Fulham Road, London S.W. 3

Department of Education, Government of Alberta, Edmonton, Alberta

Department of Extension, University of Alberta, Edmonton, Alberta
(35 mm. Educational Filmstrip Catalogue 1962. 49 pages
16 mm. Educational Filmstrip Catalogue 1962. 227 pages.)

Encyclopaedia Britannica Films Inc., 20 N. Wacker Drive, Chicago 6, Ill.

Indiana University, Audio-Visual Aids, Bloomington, Indiana.
(Continuity of Life Series. Color films $100 each. May be rented.)

National Film Board, South Side Post Office, Edmonton, Alberta

The British University Films Council, Royal College of Science and Technology, Glasgow, C.1. (Catalogue of Films for Universities, 25s)

Shell Oil Company of Canada Limited, Film Library, 1027 Eighth Avenue West (P.O. Box 100), Calgary, Alberta.
("Shell Films", 29 pages)

The Visual Aids Centre, Matthews Drew & Shelbourne Limited., 78 High Holborn, London, W.C.1.

Visual Publications Limited, 197 Kensington High Street, London, W.8.

In addtion to slides prepared photographically, in black and white or color, slides can also be drawn, typed, or lettered on to Radio Mats which come in both 2"x2" and 4"x3¼" sizes and are available in Canada from:

General Sound and Theatre Equipment Limited, 861 Bay Street, Toronto 5, Ontario.

The Educational Film Guide is published annually by the H.W. Wilson Co., of New York and contains annotated lists of all available films. Supplements are produced monthly and quarterly.

(c) Charts:

Charts have the advantage over other visual aids that they avoid the disrupting effect of darkening the room. In addition to the regular biological supply houses, charts are obtainable from:

Denoyer-Geppert Company, 5235 - 5259 Ravenswood Avenue, Chicago 40, Illinois and Miss Jessie E. Casselman, P.O. Box 157, Calgary, Alberta

Charts are also readily made in school, in art classes, by artistically minded students in biology classes, or by laboratory technicians. Chart cloth is obtainable in a width of 35" from Gaults Albert Limited, 10343 - 107 Street, Edmonton, Alberta. The only other requirements are India ink, Chinese white, pens and brushes, and 3/4" half round wood and screw eyes for the ends. A useful technique is to project textbook or catalogue material on to the cloth with an opaque projector, draw in pencil and finish in ink.

Charts may be labelled or not, as required. Lettering may be visible to the instructor only, or to the class and the instructor. Contrasting colors are often helpful, and size should always be generous.

4. A BASIC REFERENCE LIBRARY (* The more useful Items)

General

Abercombie, M., C.J. Hickman and M. L. Johnson. 1957. A Dictionary of Biology. 3rd Edition. Penguin Books, Harmondsworth.

Benton, A. H., and W. E. Werner, Jr. 1961. Manual of Field Biology and Ecology. Burgess Publishing Co., Minneapolis.

Bibby, C. 1956. Simple Experiments in Biology. Heinemann, London.

Bonner, D. M. 1961. Heredity. Foundations of Modern Biology. Prentice-Hall, Englewood Cliffs, New Jersey.

Clark, S.B., and Mould J. A. 1954. Biology for Today. Revised Edition. Cambridge Book Co., New York.

Darwin, C. The Origin of Species by Means of Natural Selection. Many Editions. John Murray, London.

Deason, H. J., and R. W. Lynn. 1961. An Inexpensive Science Library. 5th Edition. American Association for the Advancement of Science, Washington.

Facilities and Equipment for Science and Mathematics: 1960. U.S. Government Printing Office, Washington 25, D.C.

Lawson, C., and R. Paulson. Laboratory and Field Studies in Biology. Holt, Rinehart and Winston, Inc., New York.

Morgan, Ann H. 1930. Field Book of Ponds and Streams. G. P. Putnam's Sons, New York.

*Morholt, Brandwein, Joseph. A Sourcebook for Biological Sciences. W. J. Gage Limited, 1500 Birchmount Road, Scarborough, Ontario.

School Facilities for Science Instruction: 1954. National Science Teachers Association, 1201 Sixteenth Street N.W., Washington 6, D.C.

Science Facilities for High Schools: Hurd. Stanford Press, Stanford, California.

Simpson, G.G., C. S. Pittendrigh, and L. H. Tiffany. 1957. Life, an Introduction to Biology. Harcourt, Brace and Company, New York.

Singer, C. 1931. A short History of Biology. Oxford.

Swanson, C. P. 1960. The Cell. Foundations of Modern Biology, Prentice-Hall, Englewood Cliffs, New Jersey.

The Teaching of Science in Secondary Schools. 2nd Edition, 1958. John Murray, London.

Wallace, B., and A. M. Srb. Adaptation. 1961. Foundations of Modern Biology. Prentice-Hall, Englewood Cliffs, New Jersey.

Botanical - Fungi, Algae, and Mosses

Christensen, C. M. 1955. Common Fleshy Fungi. 2nd Edition. Burgess Publishing Company, Minneapolis.

Conard, H. S. 1944. How to Know the Mosses. Wm. C. Brown Co., Duburque, Iowa.

Hale, M. E. Jr. 1961. Lichen Handbook. Smithsonian Institution, Washington, D.C.

Prescott, G. W. 1954. How to Know the Fresh-water Algae. Wm. C. Brown Company, Duburque, Iowa.

Botanical - Higher Plants

Brown, Annora. 1954. Old Man's Garden. J. M. Dent and Sons (Canada) Limited, Toronto.

Carmichael, L. T. 1961. Prairie Wildflowers. J. M. Dent & Sons (Canada) Limited, Toronto.

Budd, A. C. 1957. Wild Plants of the Canadian Prairies. Queen's Printer, Ottawa.

*Cunningham, G. C. 1956. Native Trees of Canada. 5th Edition. Queen's Printer, Ottawa.

*Department of Botany; University of Alberta. Collecting and Identifying Plants. University of Alberta, Department of Extension, Edmonton.

Dodge, B. S. 1959. Plants that changed the World. Little, Brown and Co., Boston.

*Frankton, C. 1955. Weeds of Canada. Queen's Printer, Ottawa

Hardy, G. A., and Winifred V. Hardy. 1949. Wild Flowers in the Rockies. H. R. Larson Publishing Co., Saskatoon.

Moss, E. H. 1960. Flora of Alberta. University of Toronto Press, Toronto.

Muenscher, W. C. 1930. Keys to Woody Plants. 3rd Edition. Pub ished by the author, Ithaca, New York.

Cunningham, G. C. 1958. Forest Flora of Canada. Queen's Printer, Ottawa.

Pohl, R. W. 1953. How to Know the Grasses. Wm. C. Brown Co., Duburque.

Hill, J. B., and others. Botany. 3rd Edition, 1960. McGraw-Hill Book Company, Toronto.

Zoology - General and Invertebrates

*Anderson, R. M. 1960. Methods of Collecting and Preserving Vertebrate Animals. 3rd Edition. National Museum of Canada.

*Bird, R. D. 1961. Ecology of the Aspen Parkland of Western Canada in Relation to Land Use. Queen's Printer, Ottawa.

Buchsbaum, R. 1938. Animals without Backbones. University of Chicago Press and Penquin Books.

Carson, Rachel. 1955. The Edge of the Sea. Mento Books, The New American Library. New York.

Hanson, E. D. 1961. Animal Diversity. Foundations of Modern Biology, Prentice-Hall Inc., Englewood Cliffs, New Jersey.

*Hickman, C. P. 1955. A Field Manual of Animal Ecology and Natural History. Burgess Publishing Company, Minneapolis.

Jahn, T. L. 1949. How to Know the Protozoa. Wm. C. Brown Co., Dubuque.

Murie, O. J. 1954. A Field Guide to Animal Tracks. Houghton Mifflin Co., Boston.

*Storer, T. I., and R. L. Usinger. 1957. General Zoology. 3rd Edition. McGraw-Hill Book Co, Toronto.

Von Buddenbrock, W. 1953. The Senses. University of Michigan Press.

Yapp, W. B. 1960. Introduction to Animal Physiology. 2nd Edition. Oxford University Press, Oxford.

Insects and other Arthropods

*Beirne, B. P. 1955. Collecting, preparing and preserving insects. Queen's Printer, Ottawa.

Burr, M. 1954. The Insect Legion. James Nisbet and Company, London.

Cheesman, Evelyn. 1932. Insect Behavior. Philip Allan and Company Ltd., London.

*Cheesman, Evelyn. 1952. Insects Indomitable. G. Bell, London.

Clausen, Lucy. 1954. Insect Fact and Folklore. The Macmillan Co., London.

Essig, E. O. 1926. Insects of Western North America. The Macmillan Co., New York.

Von Frisch, K. 1954. The Dancing Bees. Methuen and Company, London.

Gertsch, W. J. 1949. American Spiders. D. Van Nostrand Co., Inc., Princeton.

Goetsch, W. 1957. The Ants. University of Michigan Press, Ann Arbor.

Imms, A. D. 1957. A General Textbook of Entomology. 9th Edition. Ryerson Press, Toronto.

*Jaques, H. E. 1947. How to Know the Insects. Wm. C. Brown Co., Dubuque..

Kaston, B. J. 1952. How to Know the Spiders. Wm. C. Brown Co., Dubuque.

*Klots, A. B. A field guide to Butterflies. 1951. Houghton Mifflin Company, Boston.

Lutz, F. E. 1948. Field Book of Insects. 3rd Edition. G. P. Putnam's Sons, New York.

McMullen, R. D. 1955. The Insect Collector's Guide. Entomological Society of Alberta.

Richards, O. W. 1953. The Social Insects. MacDonald, London.

Urquhart, F. A. 1949. Introducing the Insect. Clarke, Irwin and Company Ltd., Toronto.

Fishes, Amphibia and Reptiles

Carl, G. C. 1959. The Amphibians of British Columbia. British Columbia Provincial Museum, Victoria.

Carl, G. C. 1960. The Reptiles of British Columbia. 3rd Edition. British Columbia Provincial Museum, Victoria.

Carl, G. C., and W. A. Clemens, C. C. Lindsey. 1959. The Freshwater Fishes of British Columbia. 3rd Edition. British Columbia Provincial Museum, Victoria.

Zim, H. S., and H. H. Shoemaker. 1956. Fishes. A Golden Nature Guide, The Musson Book Co., Ltd., Toronto.

Zim, H. S., and H. M. Smith. 1956. Reptiles and Amphibians. A Golden Nature Guide, The Musson Book Co., Ltd., Toronto.

Birds

Allen, A. A. 1961. The Book of Bird Life. 2nd Edition. D. Van Nostrand Co., Toronto.

Edminster, F. C. 1954. American Game Birds of Field and Forest. Charles Scribner's Sons, New York.

Hochbaum, H. A. 1955. Travels and Traditions of Waterfowl. University of Minnesota Press, Minneapolis.

Hylander, C. J. 1959. Feathers and Flight. Macmillan, New York.

Murphy, R. C., and D. Amadon. 1953. Land Birdsoof America. McGraw-Hill Book Co., Toronto.

*Peterson, R. T. 1961. A Field Guide to Western Birds. 2nd Edition. Houghton Mifflin Company, Boston.

*Salt, W. R., and A. L. Wilk. 1958. The Birds of Alberta. Hamly Press Ltd., Edmonton, Alberta.

Taverner, P. A. 1934. Birds of Canada. National Museum of Canada. Ottawa.

Mammals

Anderson, R. M. 1946. Catalogue of Canadian Recent Mammals. Bulletin No. 102, National Museum of Canada. Ottawa, Queen's Printer.

Bourliere, F. 1954. The Natural History of Mammals. Alfred A. Knopf, New York.

*Burt, W. H., and R. P. Grossenheider. 1952. A Field Guide to the Mammals. Houghton Mifflin Co., Boston.

Cowan, I. McT., and C. J. Guiguet. 1960. The Mammals of British Columbia. British Columbia Provincial Museum, Victoria.

5. FIELD TRIPS & COLLECTIONS

Before any field trip is organized the teacher must clear this with his principal, and if necessary with the school board.

Field work is an essential ingredient of biological education and must be incorporated in high school biology courses. The following items are suggestions as to how this might be done. These are arranged in order of the facility with which we think they could be implemented in Albertan schools. These proposals are followed by a list of equipment and specific field projects are listed in the unit on renewable resources.

Collect and bring: Classes in biology at any level may be instructed to collect a specified number of items in a specified category and bring them into class. This makes profitable use of out of school time or to-and-from school time, can form the basis of permanent school collections, and provide classroom material which might otherwise have to be bought. Suggested categories include: tree leaves, diseased or insect damaged tree leaves, leaves of dicotyledon herbs, flowers or seeds of grasses, fruits (no apples!), galls, insects, other invertebrates, vertebrates or parts of them - feathers, bones, droppings, etc.

Field trips: For many schools this is another activity which may prove dependent on double periods, or have to be done after school hours or on weekends. With a good leader (local professional biologists etc.) these would be popular at any time. One teacher cannot handle more than eight students effectively in the field, but this need not be an insurmountable difficulty, In most classes four students with a naturalist's eye for living things in the field or with a flair for leadership, or better still, with both, can be found. A class can be divided into groups under these key persons who should be briefed first by the teacher. A trip needs to be carefully organized in advance, with full collecting equipment assembled, locality or route laid out, times of departure and return set, and so on. Every child must be equipped. The most useful areas are those with diversity of terrain and of plant cover, and the most productive localities the intersections or interfaces between two types of terrain - the edges of woods, margins of lakes and rivers, and so on. Wet, dry, sandy, wooded, and open areas may be visited separately. Warm nights with little moon are especially rewarding with light traps or bait for insects. There is much to be said for using certain areas year after year. This permits seasonal differences due to weather or other factors to be observed and gives the teacher advantages over the class.

Field study centres: The establishment of a number of centres on the lines of those operated by the Field Studies Council in Britain or the Audubon Society in the United States would be of inestimable help in high school biology teaching. These places provide minimal board and lodging for groups up to the size of a high school class, are located in areas selected specifically for their suitability for field studies, and have their own instructional staffs, collections and equipment and laboratories for examination of material. The possiblility of establishing such centres in Alberta is under consideration.

Teachers without experience in field work will do well to enlist the aid of any professional or experienced amateur biologist they can get in touch with. Organizations which may be approached for such help include:

Alberta Forest Service, especially Fish and Wildlife Division, Department of Lands and Forests, Edmonton, and Divisional Offices at Peace River, Grande Prairie, Slave Lake, White Court, Edson, Lac la Biche, Rocky Mountain House, Calgary and Blairmore.

Beaverlodge Experimental Farm, Canada Department of Agriculture.

District Agriculturists

Edmonton Bird Club

Edmonton Zoological Society

Entomological Society of Alberta,
c/o Department of Entomology
University of Alberta
Edmonton

Federal Wildlife Service, National Parks Branch
Department of Northern Affairs and National Resources

Fish and Game Leagues

Forest Biology Laboratory, Calgary

Lacombe Experimental Farm, Canada Department of Agriculture

Natural History Club, University of Alberta

Range Experimental Station, Manyberries

Red Deer Natural History Society

Research Branch, Canada Agriculture, Lethbridge
- Field Crops Laboratory
- Livestock Insect Laboratory
- Experimental Farm

Visits to the laboratories at some of these establishments and to plants of biological industries may also be worthwhile. Biology teachers will usually be welcomed as visitors to and as members of many of the organizations listed and will find these associations invaluable.

Equipment:

Each Individual: Haversack (Army surplus respirator bag suitable).

Notebook and pencil (notebook pages should be a standard card file size, e.g. 8"x5", buff or green for use in sunlight, and may be ruled with $\frac{1}{4}$" spacing in one direction and 1 cm spacing in the other).

Specimen containers: two or more varieties of items from among - vascula, vials, pill boxes, jars, plastic tubes, plastic bags, plastic or tin boxes.

Discovery equipment: one or two of - nets, insect, general, and sweeping, sieves, scoop nets, dippers, plankton nets. Axe, saw, shovels, rakes, trowels. Killing bottle, tube.

Each Sub-group: Carbon tetrachloride - for killing bottles; this is the safest material for use in schools, but see below - HAZARDS. Thermometer, compass, measuring tape. Bait* and brushes, pressure lamp, white sheet, cord, for night collecting of insects. Knife, scissors, hand lens. Tin trays - for sorting over leaf letter, mud, sand, etc.*(bad fruit,, molasses, yeast, stale beer etc. for moths and some other insects at night; walnuts, oatmeal, bird seed, peanut butter for other purposes as needed.)

Party as a whole: Stock of preservative fluid - for insects and most invertebrates, 75% ethanol, 20% water, 5% glycerine - for most other animals 4% formaldehyde in water (10% formalin). Maximum-minimum and soil thermometers, sling psychrometer for measuring relative humidity. Hand tally for counting - population, estimates, etc. Binoculars (more pairs if available from homes). Hurricane lamps: for lighting bait lines and routes between light traps in night collecting. Source of warmth in drying plant material. Large scale map. Traps - Havahart (Turtox) live traps, Macabee pocket gopher traps, wooden base snap traps. Red cloth marker strips.

Collections: Every school where biology is taught should maintain as extensive biological collections as possible. These should grow. They can become not only invaluable teaching aids and reference items, but eventually contributions to our knowledge of the spatial and temporal distribution of plants and animals. To this end all items must be fully and correctly labelled and preserved as soon as they are collected. The minimum information needed on a label is: the precise locality, date of collection, collector's name.

The following supplies, not mentioned above, will be needed in building up and maintaining collections:

Chloroform - for anaesthetizing and killing animals, degreasing specimens, etc. HAZARDOUS

Naphthalene - for keeping moths and dermestid beetles out of collections.

Paradichlorbenzene - as above, and together with naphthalene in driving insects from a Berlese funnel. HAZARDOUS

Phenol - in preventing mould growth while specimens are being relaxed and for general sterilization.

Ethanol, glycerine, acetic acid, picric acid, formaldehyde, xylol, euparol, Canada balsam, stains - in the preparation of preserving fluids and fixatives, and in the preparation of microscope slides.

Needles and thread, cotton wool (sugical), G.I. wire 18-26 S.W.G. for mammal and bird specimens.

Berlese funnels, or large funnels - soil microorganisms are best collected in this way. The original Berlese funnel has a double wall and the organisms are driven down out of the soil placed in the funnel by heating and drying. A more convenient modern variant uses a mixture of 3 parts naphthalene and 1 part paradichlorbenzene sprinkled on the surface of the soil to drive them out downwards - into a vial of alcohol-glycerine. Most specimens collected in this way will need mounting on slides. Teachers and technicians should be familiar with the techniques involved in slide making since many slides required for teaching purposes can be readily and cheaply prepared at the school.

HAZARDS: Materials used to kill insects or other animals must be poisonous; those listed offer the minimum hazards to man consistent with effectiveness for the purpose in mind. The nature of the hazards (fire, contact toxicity, toxicity by inhalation) must be explained to classes using them, and such classes must be supervised. Where these requirements cannot be met some insects and other animals may be killed by dropping into nearly boiling water or into alcohol or other fixatives or by exposing them to the vapour of ammonia or gasoline (FIRE HAZARD).

DATE DUE SLIP

F255	

QH 315-5 A33 1962 GR-12
A BROCHURE FOR TEACHERS OF
BIOLOGY IN THE HIGH SCHOOLS OF
ALBERTA -- /PRELIMINARY ED --
NL 40044978 CURR HIST